

Productive. Precise. Reliable.

AGILENT ATOMIC ABSORPTION  
SPECTROMETERS

The Measure of Confidence



**Agilent Technologies**

productive  
precise  
reliable



## AGILENT AA SPECTROMETERS

Agilent Technologies is now your premier resource and partner for atomic spectroscopy. With the 2010 addition of Varian's world-renowned AA and ICP-OES products, together with our market-leading 7700 Series ICP-MS, Agilent offers you a comprehensive range of inorganic analytical instrumentation.

### A family of Atomic Absorption solutions

Agilent's AA range is productive, user-friendly and utterly reliable. The instruments deliver the high performance that analysts require, while being equally at home in routine laboratories where reliability and simple operation are vital.

- Agilent's 140 and 240 AA combine flexibility with reliable hardware, providing budget-sensitive users with a high performance AA for routine flame/furnace/vapor analyses.
- Agilent's 240FS/280FS AA are the world's fastest, and most productive flame AA systems, with Fast Sequential operation doubling sample throughput and dramatically reducing running costs. Able to handle multi-element suites with ease, they are ideal for food and agriculture or any high throughput labs.
- Agilent's 240 and 280 AA Zeeman Graphite Furnace AA (GFAA) systems are productive and precise, providing superior furnace performance and accurate background correction.
- Double your productivity with Agilent's AA Duo, the world's only AA systems that provide true simultaneous operation of flame and graphite furnace without changeover delays.

Agilent is committed to continued product development across our entire range of atomic spectroscopy product lines. We are dedicated to delivering to you innovative technology, best-in-class quality and reliability, and unmatched support.



## Agilent

**1938**  
HP is formed

**1965**  
HP enters the gas chromatography market

**1976**  
HP 5992A introduced as the world's first benchtop GC/MS

**1983**  
HP redefines 'reliability' in GC with the introduction of the HP 5890A

**1994**  
Launch of the 4500 Series, the world's first benchtop ICP-MS

**2009**  
Launch of the Agilent 7700 Series ICP-MS featuring Agilent's HMI & ORS<sup>3</sup> Cell

**2010**  
Varian becomes a part of Agilent

## Varian

**1948**  
Varian Associates is formed

**1957**  
Built components for world's first AA (as Techtron)

**1971**  
Applies for a patent on Zeeman background correction

**1985**  
SpectrAA instruments released with central instrument control

**1997**  
Fast Sequential AA reduces analysis times by up to 50%

**2006**  
Launch of the 700 Series ICP-OES — world's fastest ICP-OES

# FOR YOUR APPLICATION

Agilent is committed to providing solutions for your application. We have the technology, platforms, and expert guidance you need to be successful.



**INDUSTRIAL**



**CHEMICAL & PETROCHEMICAL**



**ENVIRONMENTAL**



**FOOD & AGRICULTURE**



**METALS/MINING**

**FS Flame AA**  
240FS/280FS  
AA + SIPS 20

Pb & Cd in consumer goods e.g., toys, jewelry  
Ca, Cr, Cu, Fe, K, Mg & Na in plating solutions

Na & K in FAME (fatty acid methyl esters)  
Pb & Mn in unleaded gasoline

Heavy metals in soils

Major elements in food, beverage & agricultural samples  
Cations & nutrients in soils

Au, Ag & Pt group elements in ore grade material

**Flame AA**  
140/240 AA

Chemical analysis of cement  
Zn & Sb in paper  
Ca, Cr, Cu, Fe, K, Mg & Na in plating solutions

Wear metals in used oils  
Additives (e.g. Ba, Ca, Mn & Zn) in fresh lubricating oils  
Major elements in polymers

Pb in airborne particulates

Major components in steel & alloys  
Analysis of high purity gold

**Vapor Generation AA**  
240FS/280FS  
AA + VGA 77

As & Sb in zinc plate solutions  
As in human hair

As, Sb and Se in sediments  
Hg in waters, effluent, etc. (US EPA Method 245.1)  
Hg in electronics & plastics (WEEE/RoHs)

Hg and As in fish & sea foods  
Trace As & Sb levels in plant materials

**GFAA**  
240FS/280FS  
AA + GTA 120

Al & Fe in paper  
Pb in whole blood

Ni, V, Fe & Na in crude oils  
Trace metals in engine oil

Pb and Cd in fish, sea foods & plant materials

Trace metals in high purity copper

**Zeeman GFAA**  
240Z/280Z AA

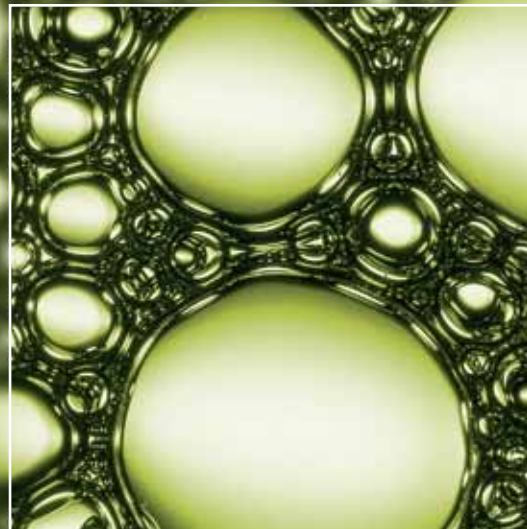
Trace elements in high purity sulfuric acid  
Na, Ca and Si in pure process water  
Al in dialysis solutions  
Se in serum

Cu, Fe & Ni in edible oils

Cd, Cu, Pb, Co & Ni in marine invertebrates  
Toxic elements in waters & soils (US EPA Method 200.9)  
Pb, Cd & Cr in electronics & plastics (WEEE/RoHs)

Minor components in steel & alloys

# productive



## THE FASTEST FLAME AA

Achieve the productivity and speed of sequential ICP with Agilent's Fast Sequential (FS) AA systems. Agilent's FS systems deliver productivity and profitability for your lab.

### 240FS/280FS AA

By measuring all elements in a single analysis of each sample, Agilent's Fast Sequential AA provides complete results for each sample in minutes. In addition to saving you valuable time and doubling sample throughput, the 240FS/280FS AA also reduce running costs.

- Determine your entire element suite without repeatedly aspirating samples
- Halve your analysis time by reducing sample analysis delays
- Determine 10 elements per sample in < 2 minutes
- Get full elemental coverage, no matter how many elements you are determining
- Reduce sample consumption — with less delay throughout analysis, less sample is wasted
- Save labor and reduce running costs — the more elements you determine, the more you save on gas, reagent and lamp usage
- Improve precision and accuracy with online internal standard corrections for physical differences, sample preparation errors, or drift

### How does Fast Sequential AA work?

1. Determination time is optimized as the FS wizard sorts the elements by wavelength and flame type
2. Optimum flame conditions are used for each elemental determination — the Hammer gas control initiates instantaneous changes to programmed flows and provides superb reproducibility
3. Reproducible wavelength positioning is achieved with minimal delays by the high speed wavelength drive (2,000 nm/min) operating under intelligent software control
4. Simultaneous operation of all lamps in FS mode
5. Fast lamp selection using a motor driven mirror

## CLEARLY BETTER SOLUTIONS FOR INDUSTRIAL & PETROCHEMICAL

Whether you are analyzing raw materials and components, or conducting product testing, robust reliable solutions are essential to your success.

Agilent's AA range is ideal for mid-sized laboratories handling a wide variety of sample types such as feed or reagents, intermediate and final products, samples from cooling systems, waste products and final residues or effluents.



Conventional AA determines only one element at a time, so samples are analyzed time and time again during a multi-element sequence.

Tube	Sample Labels	K 766.5	Na 588.0	Ca 285.3	Cu 324.8	Mg 285.2	Mn 279.5	Fe 248.3	Co 248.7	Ni 232.0
1:8	Sample 001	0.0807	0.2362	0.308	0.658	0.5388	0.337			
1:9	Sample 002	0.0887	0.4823	0.437	0.588	0.7862	0.493			
1:10	Sample 003	0.3613	0.5936	0.551	0.552	0.9496	0.546			
1:11	Sample 004	0.0345	0.4126	0.362	0.507	0.6794	0.376			
1:12	Sample 005	0.0337	0.5188	0.518	0.445	0.8574	0.479			
1:13	Sample 006	0.0800	0.8236	0.728	0.550	1.2995	0.756			
1:14	Sample 007	0.4302	0.5404	0.436	0.379	0.0740	0.526			
1:15	Sample 008	0.3168	0.7136	0.548	0.336	0.6800	0.554			
1:16	Sample 009	0.4076	0.5722	0.563	0.475	0.9458	0.390			
1:17	Sample 010	0.7119	0.4690	0.527	0.957	1.1318	0.637			
1:18	Sample 011	0.2117	0.4267	0.506	0.433	0.7544	0.423			
1:19	Sample 012	0.2870	0.5929	0.448	0.519	0.9622				
1:20	Sample 013	0.5044	0.6337	0.511	0.776	1.0136				
1:21	Sample 014	0.3000	0.6300	0.388	0.530	0.3254				
2:1	Sample 015	0.4243	0.0034	0.286	0.683	0.0053				
2:2	Sample 016	0.3272	0.0763	0.424	0.587	0.0019				
2:3	Sample 017	0.2725	0.5776	0.568	0.538	0.0019				
2:4	Sample 018	0.3493	0.4505	0.384	0.590	0.0013				
2:5	Sample 019	0.3608	0.4136	0.474	0.459	0.0010				
2:6	Sample 020	0.3827	0.5862	0.700	0.570	0.0003				
2:7	Sample 021	0.3757	0.6377	0.507	0.414	0.9939				
2:8	Sample 022	0.0018	0.2192	0.586	0.307	0.0113				
2:9	Sample 023	0.2759	0.4812	0.577	0.477	0.7795				

Using Fast Sequential AA, samples are only aspirated once and all elements are measured before progressing to the next sample.

Tube	Sample Labels	K 766.5	Na 588.0	Ca 285.3	Cu 324.8	Mg 285.2	Mn 279.5	Fe 248.3	Co 248.7	Ni 232.0
1:8	Sample 001	0.2116	1.9502	1.070	1.007	1.6213	0.976	1.818	1.005	0.969
1:9	Sample 002	0.7170	1.1267	0.967	1.002	1.6211	0.977	1.820	1.005	1.000
1:10	Sample 003	0.7036	1.1417	0.937	1.008	1.6238	0.979	1.864	1.000	1.038
1:11	Sample 004	0.6307	1.1309	0.983	0.326	1.6217	0.968	1.816	1.011	0.960
1:12	Sample 005	0.6863	1.1340	0.930	0.956	1.6626	0.969	1.864	1.015	0.971
1:13	Sample 006	0.7018	1.1444	0.972	1.009	1.6852	0.976	1.816	1.012	1.023
1:14	Sample 007	0.6990	1.1214	0.960	0.998	1.6705	0.969	1.863	1.020	0.990
1:15	Sample 008	0.3304	0.6375	0.525	0.557	0.9376	0.529	0.523	0.581	0.578
1:16	Sample 009	0.6842	1.1322	0.953	1.008	1.6668	0.976	0.977	0.979	1.029
1:17	Sample 010	0.3017	0.6400	0.589	0.572	0.9308	0.950	0.921	0.607	0.641
1:18	Sample 011	0.6718	1.1270	0.972	0.993	1.6627	0.966	1.833	1.043	1.048
1:19	Sample 012	0.9386	0.8996	0.785	0.911	1.3586	0.764	0.801	0.834	0.804
1:20	Sample 013	0.6972	1.1473	0.970	1.011	1.6624	0.962	1.801	1.017	1.000
1:21	Sample 014	0.4809	0.6322	0.781	0.733	1.2536	0.710	0.798	0.755	0.736
2:1	Sample 015	-0.0048	-0.0158	0.046	0.003	-0.0016	0.031	0.100	0.096	-0.130
2:2	Sample 016	0.4042	0.6240	0.672	0.728	1.2448	0.710	0.800	0.762	0.705
2:3	Sample 017	0.6768	1.1279	0.982	1.008	1.6858	0.982	1.862	1.048	1.045
2:4	Sample 018	0.2874	0.5318	0.582	0.458	0.9442	0.464	0.535	0.535	0.515
2:5	Sample 019	0.6760	1.1277	0.981	1.004	1.6606	0.985			
2:6	Sample 020									
2:7	Sample 021									
2:8	Sample 022									
2:9	Sample 023									

## Flexible sample handling

Automate your analyses with Agilent's SPS 3 Sample Preparation System and speed up flame AA even further. Using the SPS 3, you can create a convenient sample preparation platform for your laboratory.

- Fastest ever sample to sample changes
- High sample capacity to enhance laboratory productivity with support for rack exchange during analysis
- Advanced rinse options to reduce carryover
- Flexible configuration with standard laboratory racks for different tube types and probes
- Online dilution using the optional integrated diluter system
- Complete sample preparation capability using the optional diluter and software for offline standard and sample preparation
- Optional environmental enclosure for purging/fume extraction



# precise



## THE MOST SENSITIVE FURNACE AA

Graphite furnace AA is the preferred technique for ppb level determinations of toxic, heavy metals such as Pb and Cd. The 240Z/280Z AA with Zeeman background correction provides superior furnace performance and accurate background correction to eliminate interferences.

### 240Z/280Z AA Zeeman dedicated GFAA

The 240Z/280Z AA features Zeeman background correction for correction over the full wavelength range, structured background, spectral interferences and high background absorbances.

- Outstanding performance at ppb levels from the Constant Temperature Zone (CTZ) furnace design
- High sensitivity and freedom from interferences. Competing systems may limit performance by restricting elements, the wavelengths available for analysis, or compromising furnace conditions
- Easy alignment — only a single light source is required
- Most accurate correction with Agilent's unique magnetic waveform providing double the background correction speed of longitudinal Zeeman instruments and three point polynomial interpolation
- Simple setup and operation. Tube-CAM furnace viewing camera and Surface Response Methodology (SRM) furnace optimization wizard aid method development, enabling you to select optimum conditions for your analysis

### 240FS/240Z AA Duo system

The 240FS/240Z AA Duo system offers simultaneous flame and furnace operation that delivers the lowest cost per analysis, making it ideal for busy Environmental laboratories.

- Double the productivity of your laboratory — the Agilent AA Duo is the world's only AA system that provides true simultaneous operation of flame and graphite furnace from a central computer
- Save time with dedicated atomizers that eliminate complex setup and time consuming changeovers. Each atomizer is permanently aligned for immediate use and never needs re-alignment
- Analyze any sample, with the widest linear dynamic range from sub ppb (using furnace and hydride techniques) to percent levels (flame)
- Simplify setup and operation with advanced features such as automated wavelength and slit selection
- User friendly software delivers rapid instrument setup, easy operation and simple method development

## CLEARLY BETTER SOLUTIONS FOR ENVIRONMENTAL

In a field that demands accuracy, productivity and regulatory compliance, your challenges have never been greater. Today, environmental analysis must be done more reliably, more efficiently, and with even higher quality results.

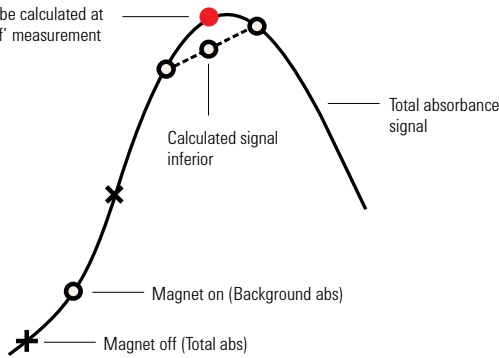
Agilent's AA range is ideal for government and contract laboratories routinely testing elements in waters, effluents, sludges and soil at major levels, and toxic elements at trace levels.



Agilent Zeeman systems use three point polynomial interpolations to accurately track the background signal, resulting in an 11-fold improvement in correction accuracy.

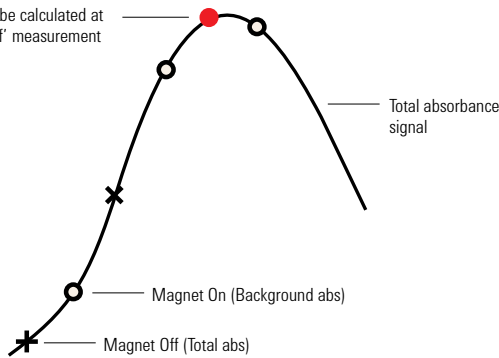
### Linear Interpolation Procedure

Background to be calculated at this 'magnet off' measurement



### Polynomial Interpolation Procedure

Background to be calculated at this 'magnet off' measurement



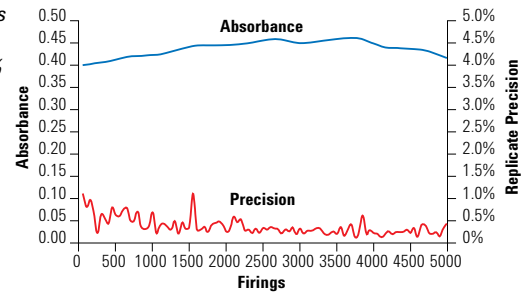
## The world's best Zeeman AA

Zeeman background correction has been widely accepted by international regulatory agencies (such as the US EPA) as the most effective background correction technique for regulated environmental analyses.

Agilent Zeeman systems feature the transverse AC modulated Zeeman configuration with the field applied across the atomizer.

This avoids the sensitivity losses observed with a DC (permanent) magnet, and maximizes light throughout compared with longitudinal designs where end caps restrict the light passing through the pole pieces of the magnet. This ensures outstanding sensitivity and maximum performance with challenging sample matrices.

Extend tube lifetimes and reduce gas consumption by 40% with the GTA120. Typical lifetimes for an aqueous copper standard with an atomization temperature of 2300 °C are shown (right).



# reliable



## MEET YOUR ANALYSIS CHALLENGES

With an extensive range of accessories to extend the capabilities of Agilent AA instruments, you can meet all your analysis challenges.

### SIPS 20

Agilent's Sample Introduction Pump Systems (SIPS) improve productivity with a range of unique benefits for flame AA.

- On-line addition of ionization suppressants during analysis, eliminating manual preparation before analysis
- Eliminates tedious, manual preparation of multiple calibration standards. SIPS requires only one calibration standard
- Fast, online dilution — even if your sample is out of the calibration range, you'll get an immediate result
- Enhances accuracy and precision — with < 2% error SIPS reduces manual dilution errors
- Performs online spiking of samples for spike recovery studies
- Automates the tedious task of flame standard addition calibrations when tackling samples with complex matrices

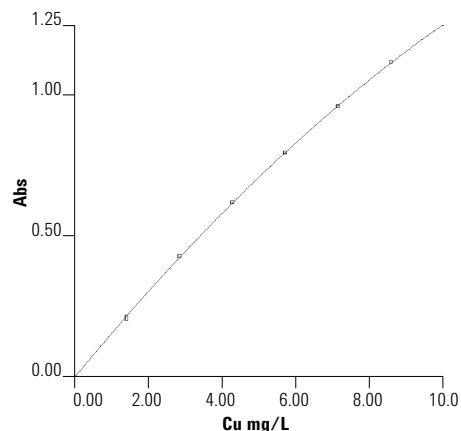
### Eliminate manual dilution errors

SIPS provides better accuracy and reproducibility than manual dilution

#### SIPS dilution performance

Actual Conc. mg/L	Measured Conc. mg/L	Dilution Factor	Dilution Error %
10.0	10.1	3.1	0.2
50.8	50.8	7.5	0.1
56.4	56.7	18.7	0.6
101.6	102.8	35.5	1.2
202.8	204.4	55.0	0.8
400.0	401.6	62.4	0.4
456.7	455.8	78.3	0.2
500.0	497.2	138.4	0.6
500.0	501.3	151.8	0.3

**Improve your calibration data**  
SIPS generates perfect calibrations every time — eliminating calibration errors and reducing tedious standard preparation.





## CLEARLY BETTER SOLUTIONS FOR FOOD & AGRICULTURE

You are committed to providing food, beverages and agricultural products of consistent quality and uncompromising safety. Agilent provides products and services to help you deliver on that promise.

Agilent's AA range is ideal for small to mid-sized screening laboratories needing to determine essential nutrients and elements at major levels, and toxic elements at trace levels.



### VGA 77

The 240 AA flame with Vapor Generation Accessory (VGA 77) is well suited to cost-conscious environmental and food and agriculture laboratories. It offers a dedicated solution for trace level determination of Hg using the regulatory approved proven cold vapor technique, or hydride forming elements such as As and Se using the vapor generation technique.

- Determine mercury and hydride forming elements (As, Se, etc.) at ppb levels
- Convenience of flame AA operation with better sensitivity than flow injection
- Achieve precisions of <2% RSD at ppb levels using conventional integration of the steady state signal. Flow injection produces transient signals requiring multiple injections and delivering less accurate results
- Greater productivity – results are obtained in less than a minute, even with three replicates per sample
- Reduce sample consumption to as little as 8 mL per element during analysis
- Simple and automatic operation, as samples are automatically combined with a continuous flow of acid and reagent, for rapid reaction and best sensitivity
- Simple changeover. Reduce setup time and eliminate cross contamination by changing modules when switching between elements with conflicting chemistries

### GTA 120 GFAA

Agilent's integrated GTA 120 Graphite Tube Atomizer provides superior furnace performance, no matter how difficult the sample, making them ideal for applications as diverse as chemical, petrochemical, food and agriculture.

- Extremely fast atomization even with difficult sample matrices
- Best signal-to-noise, due to the long atomization cell. This ensures the highest sensitivity and lowest detection limits
- Reduces running costs with extended tube lifetimes and a 40% decrease in gas consumption
- Simplifies method development. Use Tube-CAM to accurately set the probe dispensing height and confirm the optimum drying temperature. The SRM wizard also optimizes the ashing and atomization temperatures
- Run unattended longer — with capacity for 135 solutions, carousel changes are reduced for high throughput labs



# trusted



## BE SURE OF YOUR ANSWERS

With the world's fastest flame AA, the world's most sensitive furnace AA, straightforward software and unmatched instrument ruggedness and reliability, you can be sure that an Agilent AA will give you answers you can trust.

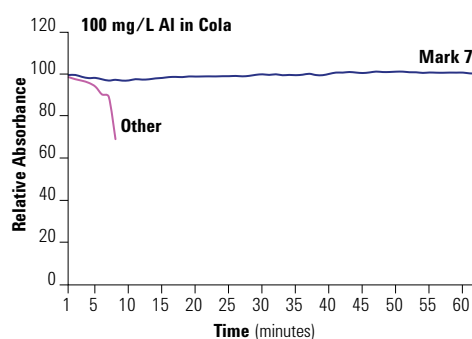
### Tune your flame AA performance

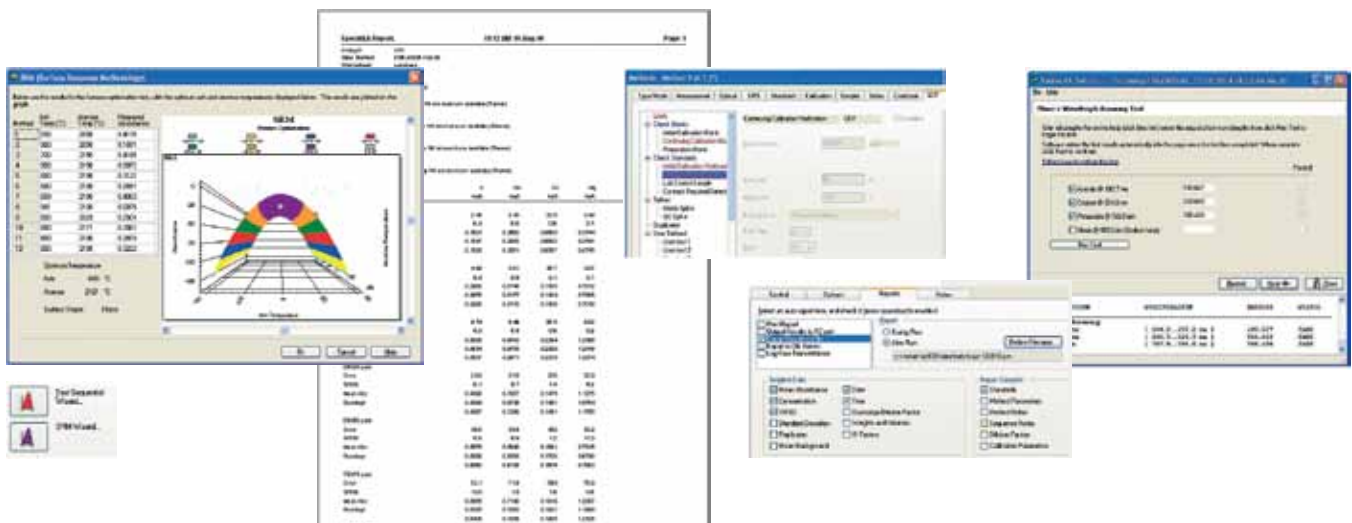
Achieve precise results quickly and handle complex matrices with Agilent's flexible and convenient Mark 7 atomization system.

- Tune performance using the externally adjustable impact bead
- Achieve high sensitivity — typically > 0.9 Abs. from 5 mg/L Cu
- Optimize precision — typically < 0.5% RSD from ten 5 second integrations
- Reduce interferences with complex samples. The removable twin headed mixing paddles ensure thorough mixing and a super fine aerosol, for precise, accurate determinations
- Minimize burner blockage – the contoured design provides outstanding resistance to blockage, even with the most difficult samples
- Corrosion-resistant components provide increased durability making it ideal for high acid matrices

### Application flexibility

The Mark 7 atomization system provides the capability to routinely handle high matrix samples, and the flexibility to achieve high sensitivity.





Guide >

Report >

Validate >

Integrate >

Certify >

# CLEARLY BETTER SOFTWARE

User friendly software with all instrument controls, sample results and signal graphics accessible from one window.

- Be guided through every aspect of analysis, such as setting up a Fast Sequential sequence or creating custom racks and layouts for use with the SPS 3.
- Eliminate method development and automate furnace optimization with the Surface Response Methodology (SRM) wizard. This wizard recommends the optimum parameters and automatically creates a method using these conditions.
- Got an urgent sample to run? Simply click the Random Sample option to run it immediately. When complete, the system will resume the programmed sequence.
- With flexible reporting options you can select which data to include and the report type, including sequential or multi-element formats. You can also report your sample results in units that are independent of the concentration units used for calibration. Simply define the units required and the conversion factor (e.g., % oxide) – the software does the rest for you.
- Save on downtime and running costs by tracking the operating lifetime of key consumables such as lamps, electrodes and pump tubing. For GLP compliance, you can also track how many replicates or samples have been run.
- Validate your results during analysis with a comprehensive range of QC tests. Measure a matrix spike or certified QC standard, or program the system to ensure full compliance with US EPA requirements.
- Integrate your Agilent AA into your workflow by interfacing with your third party LIMS or other data management system. Directly import and export to the LIMS online, eliminating tiresome and error-prone manual transfers.
- Certify instrument performance using Agilent's Qualification services. Comprehensive qualification plans for flame, furnace and vapor operation are available, ensuring system performance is regularly checked and certified to factory specifications.

# THE COMBINED BENEFITS OF TWO LEADERS IN ATOMIC SPECTROSCOPY

With the 2010 addition of Varian, Inc., Agilent now offers an even greater range of instrumentation and the most comprehensive columns and supplies portfolio in the market. Just as important are the best-in-class service and technical support teams, focused on finding solutions for our customers. Agilent is here to provide the technology — and *the Measure of Confidence* — you need to be successful.

## An expanded portfolio of solutions from the leader in ICP-MS

The range of Agilent AA, ICP-OES and ICP-MS instruments offers unmatched performance, and the highest level of reliability and ease-of-use. The instruments are backed by a combined global network of dedicated and experienced support staff.

The industry's widest range of columns and supplies ensures that your Agilent Atomic Spectroscopy instruments will perform for the long term. Agilent also manufactures its own range of AA lamps, to guarantee performance and reliability.



Agilent 7700 Series ICP-MS offers unmatched matrix tolerance and interference removal, and the smallest footprint of any ICP-MS.



Agilent 700 Series ICP-OES is the world's most productive high performance simultaneous ICP-OES.



**Our catalogue of new applications is ever growing.**

To learn about the latest, contact your local Agilent Representative or visit us at:  
[www.agilent.com/chem/](http://www.agilent.com/chem/)

**Find out how Agilent's Atomic Spectroscopy Solutions can deliver the productivity, reliability and accuracy you need.**

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[agilent\\_inquiries@agilent.com](mailto:agilent_inquiries@agilent.com)

Europe

[info\\_agilent@agilent.com](mailto:info_agilent@agilent.com)

Asia Pacific

[adinquiry\\_aplsc@agilent.com](mailto:adinquiry_aplsc@agilent.com)

Availability of chemicals dependent upon import restrictions.

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The Measure of Confidence



**Agilent Technologies**